US Army Corps of Engineers®
Engineer Research and Development Center

Sustainable Design Can Reduce Energy Demand

The Next Big Thing In Energy Conservation: *Back To The Future**

Some of our best available methods of energy management and conservation can be found in an unlikely location: the past. When we take a hard look at the "big picture" we see that the Army may expend enormous amounts of energy duplicating work that was done 30, 50, or even 100 years ago. It happens every time we erect a new building instead of using an existing one that could suit the purpose. "Old" doesn't automatically mean "inefficient" any more: it means 'there's gold in them th'ar hills!" And Bronze. Even Silver and Platinum!

Everything on an installation is, in a sense, made of energy, and today this energy costs the Army more than ever. Example: we all know that wood is a renewable resource and is basically a form of stored solar energy. But the price the Army pays for that wood actually includes the gasoline burned to fell the timber, diesel fuel burned to haul the logs — first to the mill, then later to processors, wholesalers, and retailers. This amounts to out-of-pocket cash expenditures for energy, but we usually account for these costs as construction materials. And we rarely account for the additional costs our nation pays for fresh two-by-fours: airborne particulates, greenhouse gases, and depletion of fossil fuel reserves.

This big-picture perspective on energy reflects a new line of thinking about economics called *sustainability*. The concept of sustainability attempts to account for the true, complete costs of all human activity. The Army has embraced and mandated sustainable design as a beneficial and economical way to manage construction projects and facilities. This mandate is incorporated into Engineer Technical Letter (ETL) 1110-3-491, *Engineering and Design – Sustainable Design for Military Facilities* (May 2001).

According to a conventional view, it may be appropriate to bulldoze an old building and replace it with a brighter, tighter facility that uses, say, 30 percent less energy. But if we take a closer look at the big picture, maybe it would make more energy sense to adapt a vintage building to current purposes. Here's why:

- Erecting a new building will require an energy investment to either demolish an existing building or to prepare an entirely new site (including utility and sanitation lines, roads, etc., in the latter case).
- Major energy inputs to a vintage building have already been completed and are stored in the economic value of the sitework, the frame, the plumbing lines, the built-ins, etc., and it makes no economic sense to truck this value away to a landfill.
- Even with a conscientious demolition program, where high-value materials are recycled, substantial new energy inputs are required to bring these materials back to market.

A 'new wave' approach to facility delivery might see an installation satisfying both sustainability mandates and historic preservation compliance requirements by exploiting the passive energy-conservation features of vintage buildings. Many facilities built before affordable electrification or refrigeration equipment were loaded with sustainable features because they *had* to be in order to be habitable. Many historic and vintage buildings boast:

- siting features and landscaping that reduce solar energy gains during the cooling season while

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* Adapted from: Webster, Julie L., and Gordon L. Cohen, *Public Works Digest*, vol XIV, no. 5 (USACE Installation Support Division, September/October 2002).

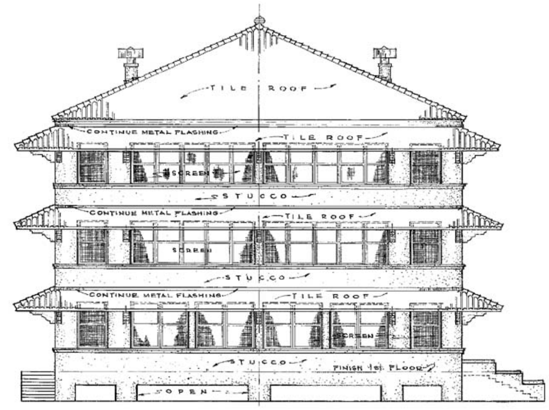
providing northerly windbreaks and passive solar heating during the heating season
- high ceilings which, in conjunction with historically compatible ceiling fans, can exploit convection and thermal stratification to comfortably condition the occupied space while moving seasonally uncomfortable temperatures up and away from the occupants
- cupolas, monitors, skylights, sunrooms, porches, tall windows, and transoms admit natural light into interior spaces and reduce the daytime demand for artificial lighting
- user-operable windows, shutters, blinds, shades, awnings, and vents, which provide energy-neutral ways to tailor temperature, lighting, and ventilation to the differing needs of occupants in different zones of the building.

These few examples barely scratch the surface of the energy-saving potential of many older Army buildings. The Army has a huge inventory of vintage buildings requiring some kind of historic preservation attention in order to comply with requirements of the *National Historic Preservation Act of 1966*:

- 14,000 listed or eligible for the National Register of Historic Places
- 30,000 more that are old enough for the National Register but have not been evaluated
- 50,000 Cold War-era buildings coming of age for National Register eligibility.

These buildings are economic resources that are already standing in the field, ready to be reborn into the Army's inventory of sustainable facilities. But we do not assume that every old building has historical significance, and likewise we cannot assume that every old building provides the appropriate raw material for sustainable reuse. We need a reliable way to separate the real property from the rubble, but we can't assess any building — whether decades old or commissioned yesterday — for sustainability just by doing a walk-through. So where do we begin to analyze the big-picture energy costs and benefits of facility reuse (or new construction)?

The answer is SPiRiT, the Sustainable Project Rating Tool. SPiRiT was developed by ERDC/CERL in coop-



This historic barracks building, designed for the tropical heat and humidity of Fort Clayton in the former Panama Canal Zone, sports numerous sustainable details, including deep "mediaguas" to shelter the huge screen windows from torrential rain and midday sun.

eration with the U.S. Green Building Council. SPiRiT is a military-specific extension of a U.S. Green Building Council sustainability tool called Leadership in Energy and Environmental Design, or LEED. SPiRiT enables the user to rate the sustainability of any existing or proposed facility in terms of detailed sustainability criteria. The tool uses an integral point system to designate a project's sustainability level as Bronze, Silver, Gold, or Platinum (the latter being the highest rating). ETL 1110-3-491 mandates that Army facilities be planned, designed, and built using sustainable design concepts, and recommends that all Army facility projects achieve at least the SPiRiT Bronze rating.

When energy sustainability is an installation's goal, as it now *must* be, the application of SPiRiT to historic properties offers the Army a tremendous opportunity to harness 'yesterday's energy' in order to reduce tomorrow's costs. A sustainable approach to facility delivery can help us retain the value of past real property investments, improve quality of life on installations, and preserve the national heritage — both in terms of energy resources and history.

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